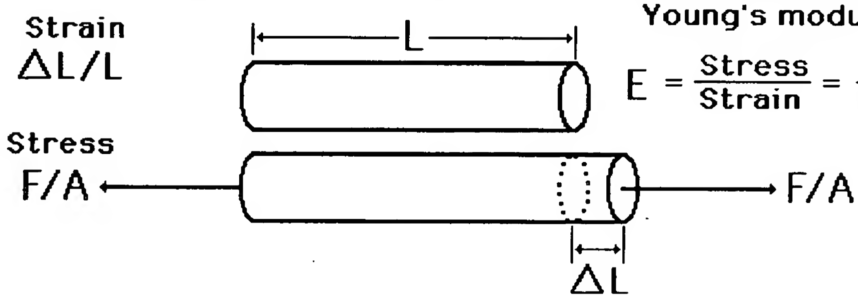
Young's Modulus

For the description of the elastic properties of linear objects like wires, rods, columns which are either stretched or compressed, a convenient parameter is the ratio of the stress to the strain, a parameter called the Young's modulus of the material. Young's modulus can be used to predict the elongation or compression of an object as long as the stress is less than the yield strength of the material.



Young's modulus

$$E = \frac{\text{Stress}}{\text{Strain}} = \frac{F/A}{\Delta L/L}$$

Elastic Properties of Selected Engineering Materials

Material	Density (kg/m^3)	Young's Modulus 10^9 N/m^2	Ultimate Strength S_u 10^6 N/m^2	Yield Strength S_y 10^6 N/m^2
Steel[a]	7860	200	400	250
Aluminum	2710	70	110	95
Glass	2190	65	50[b]	...
Concrete[c]	2320	30	40[b]	...
Wood[d]	525	13	50[b]	...
Bone	1900	9[b]	170[b]	...
Polystyrene	1050	3	48	...

a Structural steel (ASTM-A36), b In compression, c High strength, d Douglas fir

Data from Table 13-1, Halliday, Resnick, Walker, 5th Ed. Extended.

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Bulk Elastic Properties

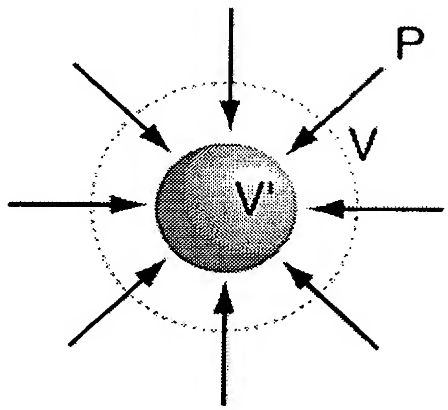
The bulk elastic properties of a material determine how much it will compress under a given amount of external pressure. The ratio of the change in pressure to the fractional volume compression is called the bulk modulus of the material.

A representative value for the bulk modulus for steel is

$$B_{steel} = 160 \times 10^9 \frac{N}{m^2}$$

and that for water is

$$B_{water} = 2.2 \times 10^9 \frac{N}{m^2}$$



Bulk modulus:

$$B = \frac{\Delta P}{\Delta V/V}$$

P = pressure
V = volume

The reciprocal of the bulk modulus is called the compressibility of the substance. The amount of compression of solids and liquids is seen to be very small.

The bulk modulus of a solid influences the speed of sound and other mechanical waves in the material. It also is a factor in the amount of energy stored in solid material in the Earth's crust. This buildup of elastic energy can be released violently in an earthquake, so knowing bulk moduli for the Earth's crust materials is an important part of the study of earthquakes.

A common statement is that water is an incompressible fluid. This is not strictly true, as indicated by its finite bulk modulus, but the amount of compression is very small. At the bottom of the Pacific Ocean at a depth of about 4000 meters, the pressure is about 4×10^7 N/m^2. Even under this enormous pressure, the fractional volume compression is only about 1.8% and that for steel would be only about 0.025%. So it is fair to say that water is nearly incompressible. Reference: Halliday, Resnick, Walker, 5th Ed. Extended.

Compressibility of Liquids

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Material properties

DBI Plastics uses a number of plastic materials in producing protective caps and plugs. The following tables contain in on the physical properties of the materials and their short-term resistance to various chemicals and other liquids.

Physical properties

Abbre-viation	Description	Density	Elonga-tion at rupture	Tensile strength	Elastic modulus	Wate abso (24 h 20°C
PELD	Polyethylene, low density	0,92 g/cm^3	200%	8 MPa	0,17 GPa	<0,1%
PELLD	Polyethylene, linear low density	0,93 g/cm^3	500%	11 MPa	0,32 GPa	<0,1%
PEHD	Polyethylene, high density	0,96 g/cm^3	9%	26 MPa	1,15 GPa	<0,1%
PA 6	Polyamide 6	1,13 g/cm^3	4%	50 MPa	1,2 GPa	9%
PA 6.6	Polyamide 6.6	1,13 g/cm^3	5%	60 MPa	1,8 GPa	8,5%
PA 6.6 w/15%	Polyamide 6.6 w/15% glass fibre	1,23 g/cm^3	5%	100 MPa	4,4 GPa	7%
PS	Polystyrene	1,04 g/cm^3	45%	20 MPa	1,5 GPa	0,06%
PP	Polypropylene	0,91 g/cm^3	>50%	35 MPa	1,55 GPa	<0,1%
EVA	Ethylene vinylacetate	0,94 g/cm^3	750%	19 MPa	0,07 GPa	0,1%
TPE	Thermoplastic elastomer	0,97 g/cm^3	460%	8,5 MPa	0,06 GPa	0%
SI	Polysiloxane (silicone)	1,36 g/cm^3	700%	7,6 MPa	-	0%
PF	Phenol plastic (bakelite)	1,40 g/cm^3	4%	45 MPa	8 MPa	0,5%

The values in the table are indicative only.

Temperature resistance

Abbreviation	Description	Hardness	Temperatures: Dim. stability withou Min.	Short-lived max.	Su ma
PELD	Polyethylene, low density	Soft and elastic	-30°C	+70°C	+50
PELLD	Polyethylene, linear low density	Soft and elastic	-30°C	+80°C	+70
PEHD	Polyethylene, high density	Relatively stiff	-30°C	+110°C	+80
PA 6	Polyamide 6	Hard and tough	-30°C	+160°C	+70
PA 6.6	Polyamide 6.6	Hard and tough	-30°C	+200°C	+90
PA 6.6 w/15%	Polyamide 6.6 w/15% glass fibre	Hard and tough	-30°C	+240°C	+12
PS	Polystyrene	Hard and brittle	-10°C	+80°C	+70
PP	Polypropylene	Stiff and hard	-25°C	+154°C	+10
EVA	Ethylene vinylacetate	Very soft and elastic	-60°C	+65°C	+55
TPE	Thermoplastic elastomer	Extremely soft and elastic	-60°C	+150°C	+13
SI	Polysiloxane (silicone)	Extremely soft and elastic	-50°C	+315°C	+23
PF	Phenol plastic (bakelite)	Hard	-50°C	+180°C	+14

Since no account is taken of individual products, their design and their thickness, the table must be considered as ind DBI Plastics accepts no responsibility for how the information is used.

The short-lived maximum temperatures must be taken as meaning the time it takes to powder-coat items.

Chemical r sistance

Abbreviation	Description	Water - cold	Water - hot	Chlorous solution	Engine oil	Diesel oil	Silicone	Petrol	Acetone	Alcohol	Ammonia 30%	Hydrochl. 35%	Sulph. acid 40%	Nitric acid 10%	UV radiation[1]
PELD	Polyethylene, low density	●	●	○	●	◐	◐	◐	◐	●	●	●	◐	○	○
PELLD	Polyethylene, linear low density	●	●	○	●	◐	◐	◐	◐	●	●	●	◐	○	○
PEHD	Polyethylene, high density	●	●	●	●	◐	●	●	◐	●	●	●	●	●	○
PA 6	Polyamide 6	●	●	○	●	●	●	●	●	◐	●	○	○	○	◐
PA 6.6	Polyamide 6.6	●	●	○	●	●	●	●	●	◐	●	○	○	○	◐
PA 6.6 w/15%	Polyamide 6.6 w/15% glass fibre	●	●	○	●	●	●	●	●	◐	●	○	○	○	◐
PS	Polystyrene	●	●	◐	○	○	●	○	○	○	●	◐	◐	◐	○
PP	Polypropylene	●	●	○	○	○	◐	○	○	●	◐	◐	◐	◐	○
EVA	Ethylene vinylacetate	●	●	○	◐	◐	○	○	○	●	●	●	○	○	○
TPE	Thermoplastic elastomer	●	●	●	○	○	○	◐	◐	●	◐	◐	●	◐	●
SI	Polysiloxane (silicone)	●	●	◐	◐	◐		◐	◐	●	○	○	○	○	●
PF	Phenol plastic (bakelite)	●	●		●	●	●	●		●	◐	◐	○	○	◐

Since temperature and time are of great significance where chemical resistance is concerned, the table must be consi indicative only. DBI Plastics accepts no responsibility for how the information is used.

The table is based on ambient temperatures around 20°C.

● Resistant ◐ Partly resistant ○ Not resistant

[1] The ultraviolet resistance of several of the types of plastic can be improved by adding ultraviolet stabiliser or black pigmentation.

[2] TPE is not suitable for plugs or caps that are in contact with oil, i.e. oil makes them swell. However, becaus property, TPE seals which are held in position by a threaded plug tighten more effectively.

Environmental information

Disposal of used items

Plastics can be burnt in incineration plants approved by local and national authorities. Many of the plastics, e.g. PE, on harmless products such as water and carbon dioxide when burnt in an approved incineration plant. Because they are p from oil or natural gas, when incinerated these plastics also have a high heat value of around 46 MJ/kg. They therefore the same calorific value as fuel oil. A suitable quantity of plastic gives cleaner combustion of the remaining waste: a fa benefit to incineration plants.

In fact, it is also possible to recycle several of the plastics named. Depending on how recycled plastic is to be used re companies impose requirements as to the cleanliness of the material and request information on its composition. DB! gladly give such information, but cannot receive used products for recycling.

Energy consumption

The amount of energy consumed in producing raw materials differs, depending on the type of plastic involved. The EC defines a typical total energy consumption for the production of raw materials, although in practice this varies between The amount of energy DBI Plastics uses in turning raw materials into finished items also varies from product to produc description of energy consumption is therefore possible.

The following table states whether it is possible to recycle various materials, and the combustion products they give of incinerated.

Environmental information

Abbreviation	Description	Energy cons. for typical raw mat. production	Recycling possible	Combustion produc typical incineration
PELD	Polyethylene, low density	88.55 MJ/kg	Yes	Water (H_2O), carbon diox
PELLD	Polyethylene, linear low density		Yes	Water (H_2O), carbon diox
PEHD	Polyethylene, high density	80.98 MJ/kg	Yes	Water (H_2O), carbon diox
PA 6	Polyamide 6		Yes	Water (H_2O), carbon diox carbon monoxide (CO), nit
PA 6.6	Polyamide 6.6	143.61 MJ/kg	Yes	Water (H_2O), carbon diox carbon monoxide (CO), nit
PA 6.6 w/15%	Polyamide 6.6 w/15% glass fibre		Yes	Water (H_2O), carbon diox carbon monoxide (CO), nit
PS	Polystyrene	83.64 MJ/kg	Yes	Water (H_2O), carbon diox carbon monoxide (CO)
PP	Polypropylene	80.03 MJ/kg	Yes	Water (H_2O), carbon diox carbon monoxide (CO)
EVA	Ethylene vinylacetate		Yes	Water (H_2O), carbon diox
TPE	Thermoplastic elastomer	48.15 MJ/kg	Yes	Water (H_2O), carbon diox chlorine (Cl), nitrogen (N_2
SI	Polysiloxane (silicone)		No	Carbon dioxide (CO_2), car monoxide (CO), formaldeh
PF	Phenol plastic (bakelite)		No	Water (H_2O), carbon diox ammonia (NH_3)

The values in the table are indicative only.

Typical incineration is conducted in environmentally approved plants in temperatures around 1100°C . Incineration at lo temperatures can produce other waste substances and is therefore not recommended.

All data on materials are from raw material suppliers to DBI Plastics and therefore might vary if other suppliers are use

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Materials Properties Table

Material Name	SpG	Tens	TEB	Flex	CTE	HDT	Tmax	Tcon	UL94	DiST	$
ABS	1.04	6500	25	11000	5.3	215°F	140°F	--	H-B	--	$$
Acetal (copolymer)	1.41	9500	30	12000	5.4	220°F	180°F	1.6	H-B	420	$$
Delrin (acetal homopolymer)	1.41	11000	30	13000	4.7	250°F	180°F	2.5	H-B	450	$$
Acrylic	1.18	9000	2	14000	7.0	160°F	180°F	3.9	--	400	$
Celazole PBI	1.30	23000	3	32000	1.3	800°F	650°F	2.8	V-0	550	$$$$$
CPVC	1.52	8200	27	15000	3.7	217°F	200°F	1.0	V-0	1250	$$$
Crystex 820S Ceramic	2.70	6500	--	--	0.6	--	820°F	--	V-0	400	$$$$
Duratron XP	1.40	16000	4	20000	2.7	680°F	580°F	1.5	V-0	700	$$$$$
Ertalyte PET-P	1.41	12400	20	18000	3.3	240°F	210°F	2.0	H-B	385	$$$
Fluorosint 500 PTFE	2.32	1100	10	2200	2.4	270°F	500°F	5.3	V-0	275	$$$$
Halar ECTFE	1.68	7000	200	--	10.0	240°F	300°F	1.1	V-0	500	$$$$
Hydex 4101 PBT-P	1.31	9400	50	11600	4.5	200°F	221°F	--	H-B	410	$$$
Hydex 4101L PBT-P	1.36	7200	40	10600	5.0	195°F	221°F	--	H-B	--	$$$
Hydlar Z	1.16	16000	4	23000	1.6	470°F	300°F	--	--	--	$$$
Phenolic G-5/G-9	1.85	44000	--	50000	8.3	--	285°F	2.0	V-0	300	$$
Phenolic G-7	1.80	20000	--	30000	7.2	--	430°F	2.0	H-B	350	$$$
Phenolic G-10	1.80	45000	--	75000	5.5	--	285°F	2.0	H-B	800	$$
Phenolic G-11	1.80	43000	--	80000	7.2	--	330°F	2.0	H-B	900	$$$
Phenolic XX Paper	1.35	20000	--	20000	0.8	--	257°F	2.0	H-B	750	$$
Phenolic CE Canvas	1.37	12000	--	19000	1.1	--	257°F	2.0	H-B	550	$$
Phenolic LE Linen	1.34	13000	--	22000	1.0	--	285°F	2.0	H-B	625	$$
PCTFE (Kel-F)	2.10	5700	150	8500	7.0	167°F	350°F	1.0	--	500	$$$$
Kynar PVDF	1.77	6300	50	9700	6.6	230°F	300°F	0.7	V-0	65	$$$$
Macor MG Ceramic	2.52	--	--	13600	5.2	240°F	1832°F	10.1	--	1000	$$$$$
Noryl PPO (unfilled)	1.08	9600	30	13500	3.3	265°F	275°F	--	V-0	500	$$$
Noryl PPO (30% gf)	1.36	17800	--	20000	1.4	220°F	220°F	--	V-0	530	$$$$
Nylatron GS (moly-lube)	1.16	12500	25	17000	4.0	200°F	220°F	1.7	V-2	350	$$
Nylatron GSM (moly-lube)	1.16	10500	30	16000	3.5	200°F	200°F	--	H-B	400	$$
Nylatron GSM Blue (oil & moly)	1.16	10000	35	15000	5.9	--	200°F	--	--	--	$$
Nylatron NSM (solid-lube)	1.15	11000	20	16000	5.0	200°F	200°F	--	H-B	400	$$$

Nylon 6 (cast)	1.15	12000	20	16000	3.5	200°F	200°F	1.7	H-B	500	$$
MC901 Nylon 6 (cast)	1.15	12000	20	16000	3.5	200°F	260°F	1.7	H-B	500	$$
Nyloil (cast)	1.14	10500	50	15000	3.5	375°F	230°F	1.7	--	550	$$
Nylon 6/6 (extruded)	1.15	11500	50	15000	5.5	200°F	210°F	1.7	V-2	400	$$
Nylon (30% gf)	1.35	27000	3	39000	1.2	200°F	210°F	1.7	H-B	530	$$$
PEEK (unfilled)	1.31	16000	20	25000	2.6	320°F	480°F	1.8	V-0	480	$$$$
PEEK (15% gf)	1.4	17600	3.2	25700	1.3	480°F	480°F	3.0	V-0	--	$$$$
PEEK (20% gf)	1.45	18800	2.2	27500	1.3	580°F	480°F	3.0	V-0	--	$$$$
PEEK (30% gf)	1.54	22800	1.6	33800	1.2	600°F	480°F	3.0	V-0	175	$$$$
PEEK (30% cf)	1.41	26000	1	38000	1.0	550°F	500°F	6.4	V-0	32	$$$$
PEEK (bearing)	1.44	11000	3	27500	1.7	385°F	485°F	1.7	V-0	--	$$$$
Polycarbonate	1.20	9500	60	15000	3.9	270°F	250°F	1.3	H-B	390	$$
Polycarbonate (30% gf)	1.43	19000	10	23000	1.2	295°F	270°F	1.3	H-B	470	$$$
Polyethylene - LDPE	0.92	2000	600	--	11.5	110°F	160°F	--	--	--	$
Polyethylene - HDPE	0.95	4600	900	--	11.3	160°F	180°F	--	--	--	$
Polyethylene - UHMW	0.93	3100	1200	--	11.1	205°F	180°F	2.9	H-B	900	$
Polypropylene (copolymer)	0.90	4800	12	7000	6.2	210°F	180°F	0.2	H-B	575	$
Polypropylene (homopolymer)	0.89	4800	23	5400	6.6	173°F	170°F	0.2	--	475	$
Polystyrene (gen purp)	1.05	7500	47	6100	4.0	200°F	150°F	--	H-B	60	$
Polystyrene (hi impact)	1.04	4000	55	8700	4.2	195°F	140°F	--	H-B	45	$
PVC	1.41	7000	29	12000	6.1	176°F	140°F	0.9	V-0	544	$
Radel A PES	1.37	12200	15	16100	2.7	400°F	320°F	1.1	V-0	380	$$$
Radel R PAES	1.30	11000	30	15500	3.1	405°F	300°F	2.4	V-0	360	$$$
Rexolite 1422 (unfilled)	1.05	9000	--	11500	3.8	--	212°F	1.0	--	500	$$$
Rulon LR (maroon)	2.27	1500	200	--	varies	--	500°F	2.3	--	450	$$$
Rulon J (gold)	1.95	2000	200	--	varies	--	500°F	1.7	--	200	$$$
Ryton PPS (40% gf)	1.70	13000	2	23000	2.5	490°F	450°F	2.1	V-0	385	$$$
Ryton PPS (bearing)	1.55	10000	1	15000	1.2	490°F	450°F	2.2	V-0	--	$$$
Semitron 225 (acetal)	1.33	6100	10	6000	9.3	225°F	180°F	--	H-B	--	$$$
Semitron 410C (PEI)	1.41	9000	2	12000	1.8	410°F	340°F	--	V-0	--	$$$$
Semitron 420 (PSU)	1.45	9500	2	14500	3.2	420°F	350°F	1.5	V-0	--	$$$$
Semitron 500 (PTFE)	2.30	1100	10	2200	5.7	270°F	500°F	5.3	V-0	390	$$$
Semitron 520HR (PAI)	1.58	12000	3	20000	1.5	520°F	500°F	--	V-0	--	$$$$
TPX Polymethylpentene	0.83	4100	10	6100	1.7	212°F	200°F	1.2	H-B	20	$$$
Techtron PPS (unfilled)	1.35	13500	15	2100	2.8	250°F	425°F	2.0	V-0	540	$$$$
PTFE Teflon (unfilled)	2.16	3900	300	--	7.5	132°F	500°F	1.7	V-0	285	$$$
PTFE Teflon (25% gf)	2.25	2100	270	1950	6.4	150°F	500°F	3.1	V-0	--	$$$
PTFE Teflon (25% cf)	2.08	1900	75	2300	6.0	150°F	500°F	4.5	V-0	--	$$$
Tefzel ETFE	1.70	6100	300	--	7.4	--	311°F	--	V-0	1800	$$$
Torlon 4203 (unfilled)	1.41	18000	5	24000	1.7	532°F	500°F	1.8	V-0	--	$$$$
Torlon 4301 (bearing)	1.45	12000	3	31000	1.4	534°F	500°F	3.7	V-0	--	$$$$
Torlon 5530 (30% gf)	1.55	14000	3	22000	1.5	520°F	500°F	2.5	V-0	700	$$$$
Turcite TA (acetal)	1.49	7600	15	11000	5.2	205°F	180°F	--	--	--	$$$
Turcite TX (acetal)	1.46	5900	19	8000	5.2	205°F	180°F	--	--	--	$$$
Udel PSU	1.24	10200	80	15000	3.1	340°F	300°F	--	H-B	425	$$$

Property Descriptions and Units

SpG	Specific Gravity	grams/cm³
Tens	Tensile Strength	pounds/in²
TEB	Tensile Elongation at Break	%
Flex	Flexural Strength	pounds/in²
CTE	Coefficient of Linear Thermal Expansion	in/in/°F
HDT	Heat Deflection Temperature	°F
Tmax	Max Recommended Use Temperature	°F
TCon	Thermal Conductivity	BTU-in/ft²-hr-°F
UL94	UL94 Flammability Rating	rating
DiSt	Dielectric Strength	volts/mil
$	Relative Cost Factor	(estimated)

Conversion Factors, Material Properties and Constants

Contents

Conversion Factors

This table gives conversion factors to convert various units to their SI equivalents. It will not be very useful for people who prefer to use cgs or English units although it can be used to convert from SI to those systems.

Name	To convert from	to	multiply by	divide by
Acceleration	ft/sec^2	m/s^2	0.3048	3.2810
Area	acre	m^2	4047	2.471E-04
Area	ft^2	m^2	9.294E-02	10.7600
Area	hectare	m^2	1.000E+04	1.000E-04
Area	in^2	m^2	6.452E-04	1550
Density	g/cm^3	kg/m^3	1000	1.000E-03
Density	lbm/ft^3	kg/m^3	16.02	6.243E-02
Density	lbm/in^3	kg/m^3	2.767E+04	3.614E-05
Density	lb€s^2/in^4	kg/m^3	1.069E+07	9.357E-08
Density	slug/ft^3	kg/m^3	515.40	1.940E-03
Energy	BTU	J	1055	9.478E-04
Energy	cal	J	4.1859	0.2389
Energy	erg	J	1.000E-07	1.000E+07
Energy	ev	J	1.602E-19	6.242E+18
Energy	ft€lbf	J	1.3557	0.7376
Energy	kiloton TNT	J	4.187E+12	2.388E-13
Energy	kW€hr	J	3.600E+06	2.778E-07
Energy	megaton TNT	J	4.187E+15	2.388E-16
Force	dyne	N	1.000E-05	1.000E+05
Force	lbf	N	4.4484	0.2248

Force	ozf	N	0.2780	3.5968
Heat capacity	BTU/lbm€°F	J/kg€°C	4188	2.388E-04
Heat transfer coefficient	BTU/hr€ft^2€°F	W/m^2€°C	5.6786	0.1761
Length	AU	m	1.496E+11	6.685E-12
Length	ft	m	0.3048	3.2810
Length	in	m	2.540E-02	39.3700
Length	mile	m	1609	6.214E-04
Length	Nautical mile	m	1853	5.397E-04
Length	parsec	m	3.085E+16	3.241E-17
Mass	amu	kg	1.661E-27	6.022E+26
Mass	lbm	kg	0.4535	2.2050
Mass	lb€s^2/in	kg	1200.00	5.711E-03
Mass	slug	kg	14.59	6.853E-02
Mass flow rate	lbm/hr	kg/s	1.260E-04	7937
Mass flow rate	lbm/sec	kg/s	0.4535	2.2050
Moment of inertia	ft€lb€s^2	kg€m^2	1.3557	0.7376
Moment of inertia	in€lb€s^2	kg€m^2	0.1130	8.8510
Moment of inertia	oz€in€s^2	kg€m^2	7.062E-03	141.60
Power	BTU/hr	W	0.2931	3.4120
Power	hp	W	745.71	1.341E-03
Power	tons of refrigeration	W	3516	2.844E-04
Pressure	bar	Pa	1.000E+05	1.000E-05
Pressure	dyne/cm^2	Pa	0.1000	10.0000
Pressure	in. mercury	Pa	3377	2.961E-04
Pressure	in. water	Pa	248.82	4.019E-03
Pressure	kgf/cm^2	Pa	9.807E+04	1.020E-05
Pressure	lbf/ft^2	Pa	47.89	2.088E-02
Pressure	lbf/in^2	Pa	6897	1.450E-04
Pressure	mbar	Pa	100.00	1.000E-02
Pressure	microns mercury	Pa	1.3332	0.7501
Pressure	mm mercury	Pa	1333	7.501E-04
Pressure	std atm	Pa	1.013E+05	9.869E-06
Specific heat	BTU/lbm€°F	J/kg€°C	4186	2.389E-04
Specific heat	cal/g€°C	J/kg€°C	4186	2.389E-04
Temperature	°F	°C	0.5556	1.8000
Thermal conductivity	BTU/hr€ft€°F	W/m€°C	1.7307	0.5778
Thermal conductivity	BTU€in/hr€ft^2€°F	W/m€°C	0.1442	6.9340

Thermal conductivity	cal/cm€s€°C	W/m€°C	418.60	2.389E-03
Thermal conductivity	cal/ft€hr€°F	W/m€°C	6.867E-03	145.62
Time	day	s	8.640E+04	1.157E-05
Time	sidereal year	s	3.156E+07	3.169E-08
Torque	ft€lbf	N€m	1.3557	0.7376
Torque	in€lbf	N€m	0.1130	8.8504
Torque	in€ozf	N€m	7.062E-03	141.61
Velocity	ft/min	m/s	5.079E-03	196.90
Velocity	ft/s	m/s	0.3048	3.2810
Velocity	km/hr	m/s	0.2778	3.6000
Velocity	miles/hr	m/s	0.4470	2.2370
Viscosity - absolute	centipose	N€s/m^2	1.000E-03	1000
Viscosity - absolute	g/cm€s	N€s/m^2	0.1000	10
Viscosity - absolute	lbf/ft^2€s	N€s/m^2	47.87	2.089E-02
Viscosity - absolute	lbm/ft€s	N€s/m^2	1.4881	0.6720
Viscosity - kinematic	centistoke	m^2/s	1.000E-06	1.000E+06
Viscosity - kinematic	ft^2/sec	m^2/s	9.294E-02	10.7600
Volume	ft^3	m^3	2.831E-02	35.3200
Volume	in^3	m^3	1.639E-05	6.102E+04
Volume	liters	m^3	1.000E-03	1000
Volume	U.S. gallons	m^3	3.785E-03	264.20
Volume flow rate	ft^3/min	m^3/s	4.719E-04	2119
Volume flow rate	U.S. gallons/min	m^3/s	6.309E-05	1.585E+04

Material constants

This table gives various material properties listed alphabetically. The units are SI.

Conductivity	Acetyl	0.2300	W/m€°C
Conductivity	Acrylic	0.1400	W/m€°C
Conductivity	Aluminum 2024-T3	190.40	W/m€°C
Conductivity	Aluminum 3003	0.4000	W/m€°C
Conductivity	Aluminum 6061-T6	155.80	W/m€°C
Conductivity	Aluminum 7079-T6	121.10	W/m€°C
Conductivity	Beryllium QMV	147.10	W/m€°C
Conductivity	Borosilicate glass	1.1300	W/m€°C
Conductivity	Borosilicate glass (Tempax)	1.1300	W/m€°C
Conductivity	Concrete (sand & gravel)	1.8000	W/m€°C

Conductivity	Copper - pure	392.90	W/m€°C
Conductivity	Diamond	550.00	W/m€°C
Conductivity	Douglas fir	0.1100	W/m€°C
Conductivity	Dow Corning 200 (350cSt)	0.1590	W/m€°C
Conductivity	Dow Corning 739	0.1900	W/m€°C
Conductivity	Dow Corning 93-500	0.1500	W/m€°C
Conductivity	Dow Corning Q3-6605	0.8400	W/m€°C
Conductivity	Epoxy (Epotek 353ND)	0.0490	W/m€°C
Conductivity	Epoxy (Masterbond 11A0)	1.4400	W/m€°C
Conductivity	Glass wool	0.0400	W/m€°C
Conductivity	Gold - pure	297.70	W/m€°C
Conductivity	Helium	2.7700	W/m€°C
Conductivity	Ice	2.2000	W/m€°C
Conductivity	Iron	83.50	W/m€°C
Conductivity	Lead - pure	37.04	W/m€°C
Conductivity	Limestone	0.5000	W/m€°C
Conductivity	Magnesium HK31A-H24	114.20	W/m€°C
Conductivity	Magnesium AZ31B-H24	95.19	W/m€°C
Conductivity	Methane	0.3030	W/m€°C
Conductivity	Molybdenum - wrought	143.60	W/m€°C
Conductivity	Nickel - pure	91.73	W/m€°C
Conductivity	Nitrogen	0.1460	W/m€°C
Conductivity	Nylon	0.2400	W/m€°C
Conductivity	Platinum	69.23	W/m€°C
Conductivity	Polycarbonate	0.2000	W/m€°C
Conductivity	Polypropylene	0.4000	W/m€°C
Conductivity	Polystyrene foam	0.3600	W/m€°C
Conductivity	Polyurethane foam	0.0260	W/m€°C
Conductivity	PTFE	0.2400	W/m€°C
Conductivity	Quartz	1.3200	W/m€°C
Conductivity	SiC Alpha	77.50	W/m€°C
Conductivity	SiC sintered KT	80.00	W/m€°C
Conductivity	Silastic E	0.1800	W/m€°C
Conductivity	Silastic L	0.2800	W/m€°C
Conductivity	Silicone foam (Poron)	0.0600	W/m€°C
Conductivity	Silver - pure	417.10	W/m€°C
Conductivity	Snow (light)	0.6000	W/m€°C
Conductivity	Snow (packed)	2.2000	W/m€°C

Conductivity	Soil (coarse)	0.5200	W/m€°C
Conductivity	Soil (dry w/stones)	0.5200	W/m€°C
Conductivity	Soil (dry)	0.2300	W/m€°C
Conductivity	Soil (w/42% water)	1.1000	W/m€°C
Conductivity	Steel AISI 304	16.27	W/m€°C
Conductivity	Steel AISI C1020	46.73	W/m€°C
Conductivity	Tantalum	53.65	W/m€°C
Conductivity	Titanium B 120VCA	7.4420	W/m€°C
Conductivity	Tungsten	164.40	W/m€°C
Conductivity	Water	0.6030	W/m€°C
Conductivity	White pine	0.1100	W/m€°C
Density	Acrylic	1400	kg/m^3
Density	Air (2800 m)	0.9800	kg/m^3
Density	Air (STP)	1.2930	kg/m^3
Density	Aluminum 2024-T3	2770	kg/m^3
Density	Aluminum 3003	2700	kg/m^3
Density	Aluminum 6061-T6	2700	kg/m^3
Density	Aluminum 7079-T6	2740	kg/m^3
Density	Ammonia - liquid	682.10	kg/m^3
Density	Argon - liquid	1390	kg/m^3
Density	Beryllium QMV	1850	kg/m^3
Density	Borosilicate Ohara E6	2180	kg/m^3
Density	Borosilicate Tempax	2230	kg/m^3
Density	Concrete	2242	kg/m^3
Density	Copper - pure	8900	kg/m^3
Density	Dow Corning 200 (350cSt)	968.00	kg/m^3
Density	Fused silica	2200	kg/m^3
Density	Glass wool	64.00	kg/m^3
Density	Gold - pure	1.932E+04	kg/m^3
Density	Helium - liquid	125.00	kg/m^3
Density	Hydrogen - liquid	70.00	kg/m^3
Density	Iron	7830	kg/m^3
Density	Lead - pure	1.134E+04	kg/m^3
Density	Magnesium AZ31B-H24	1770	kg/m^3
Density	Magnesium HK31A-H24	1790	kg/m^3
Density	Methane - liquid	424.00	kg/m^3
Density	Molybdenum - wrought	1.030E+04	kg/m^3